ABSTRACT

It is an object of the present invention to provide a silicon-based thermoelectric conversion material and thermoelectric conversion element with which the thermal conductivity of a silicon-based thermoelectric conversion material can be lowered without decreasing the Seebeck coefficient and electrical conductivity of the material, which affords a marked increase in the Figure of merit. A polycrystal structure comprises crystal grains composed of a silicon-rich phase, and a added element-rich phase in which at least one type of added element is deposited at the grain boundary thereof, the result of which is an extremely large Seebeck coefficient and low thermal conductivity, allowing the thermoelectric conversion rate to be raised dramatically, and affording a silicon-based thermoelectric conversion material composed chiefly of silicon, which is an abundant resource, and which causes extremely little environmental pollution. For example, adding carbon, germanium, or tin to a silicon-based thermoelectric conversion material allows the thermal conductivity to be greatly reduced without changing the carrier concentration in the silicon-based material. A doping amount of 5 to 10 at% is ideal for lowering the thermal conductivity, and if a dopant that is added in order to produce a p- or n-type semiconductor and a group-IV element are deposited at the grain boundary of polycrystalline silicon, the resulting p- or n-type semiconductor will have a carrier concentration of 10^{17} to 10^{21} (M/m^3) and a thermal conductivity of 50 W/m · K or less.

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